

**TITLE:** Interstellar Organics, the Solar Nebula, and Saturn's Satellite Phoebe

**PRESENTATION TYPE:** Research Contributed

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**ABSTRACT BODY:**

**Abstract (2,250 Maximum Characters):** The diffuse interstellar medium inventory of organic material (Pendleton et al. 1994, Pendleton et al. 2002) was likely incorporated into the molecular cloud in which the solar nebula condensed. This provided the feedstock for the formation of planets, and the smaller icy bodies in the region outside Neptune's orbit (transneptunian objects, or TNOs). Saturn's satellites Phoebe and Iapetus open a window to the composition of one class of TNO as revealed by the near-infrared mapping spectrometer (VIMS) on the Cassini spacecraft. Phoebe (mean diameter 213 km) is a former TNO now orbiting Saturn. VIMS spectral maps of Phoebe's surface reveal a complex composition consisting of prominent aromatic (CH) and aliphatic hydrocarbon (CH<sub>2</sub>, CH<sub>3</sub>) absorption bands (3.2-3.6  $\mu$ m). Phoebe is the source of dust particles encircling Saturn, and from which particles (~5-20  $\mu$ m size) spiral inward toward Saturn. They encounter Iapetus and Hyperion where they blanket the native H<sub>2</sub>O ice of those two bodies. Quantitative analysis of the hydrocarbon bands on Iapetus demonstrates that aromatics are more abundant than aliphatic CH<sub>2</sub>+CH<sub>3</sub>, significantly exceeding the strength of the aromatic signature in interplanetary dust particles, comets, and carbonaceous meteorites (Cruikshank et al. 2013). A similar excess of aromatics over aliphatics is seen in the qualitative analysis of Titan's surface itself (Dalle Ore et al. 2012). The Iapetus aliphatic hydrocarbons show CH<sub>2</sub>/CH<sub>3</sub> ~4, which is larger than the value found in the diffuse ISM, whereas Phoebe is a primitive body that formed in the outer regions of the solar nebula and has preserved some of the original nebular inventory. Understanding the content and degree of processing of that nebular material. There are other Phoebe-like TNOs that are presently being searched in the organic spectral region, but JWST will open that possibility for a number of objects. We now need to explore and understand the organic-bearing Solar System material to the solar nebula and the inventory of ISM materials incorporated therein.